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ABSTRACT

This paper examines the long term trends in degree productivity and the effects of national policy and decisionmaking upon those trends. The examination is based on a historical perspective, a review of demography, degrees and statistical data. Projections of the relative rates of growth of the four levels of educational attainment (high school, baccalaureate, masters and doctorate) are presented. Conclusions indicate the need for quality in education: (a) improve the quality of educational attainment in the elementary and secondary school systems, (b) improve the quality and expand occupational preparation in the 2-year colleges, (c) improve the quality of the programs at the baccalaureate level where institutional growth can and must be provided, and (d) preserve advance degree programs of high quality where they presently exist. A 15-item bibliography is included. (MJM)

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Long Term Educational Attainment in the United States

INTRODUCTION

Mass higher education is in many ways closely linked to occupational preparation, historically no stranger to the American campus. Limited national resources and the spectre of a surplus of highly trained manpower produced by higher education have combined to make popular the "manpower model," which has become the means by which state and federal government will create legislation and budget allocation for the operation of the educational enterprise. Higher education will be most directly affected because of the relatively large investment per student necessary to the quality degree product which flows from universities and colleges.

There is currently much misinformation about what snapshot manpower statistics really mean, and interpretations of the many and various manpower projection models are confused. The projection of manpower supply and utilization is an uncertain art, and, in the end, depends upon how well we articulate long-range national goals and objectives and upon how much of our national wealth we invest in specific sectors of the economy.

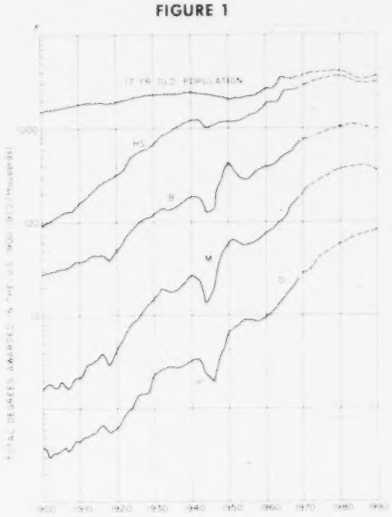
> "Some planners indicate that if we give high national priority to a number of other pressing national goals, there would be no surplus of doctorates. That of course is the difficulty in predicting the future. All future estimates are built on a little experience, many assumptions, and much speculation about events and priorities."[1]

The purpose of this paper is to examine the long-term trends in degree productivity and the effects of national policy and decision making upon those trends. From an understanding of what has gone before, a rational approach to future policy determination will hopefully be founded upon a better understanding of the future alternatives available for investment of national wealth.

HISTORICAL PERSPECTIVE

Figure 1 presents a comparison of the seventeen-year-old population and the total high school, bachelors, masters, and doctorate degrees awarded each year in the United States from 1900 through 1969, with the latest Office of Education projections of degrees to be awarded through 1980. The Office of Education methodology was employed to extend these projections through 1990.* In a later section of this paper an alternative projection will be proposed as a more likely figure for 1980, but at this point, for purposes of discussion, the Office of Education projections are presented as a base from which certain future policy decisions can be discussed.

FIGURE 1



The important features of Figure 1 are (a) the fact that high school graduates derived from the seventeen-year-old population are increasing at a decreasing rate as the number of high school graduates approaches 100 percent of the high school age population; (b) the growth in the award of baccalaureate degrees approximately parallels the growth of high school graduates since about 1920; (c) the growth in the award of masters and doctorate degrees exceeds the growth rate of baccalaureate and high school awards.

The long-term trends show major short-term fluctuations which can be related to the nation's involvement in major wars and to the major economic down-turns and prosperity since 1900. Of particular interest is the rapid growth of educational attainment which occurred during

* The data and projections were supplied by Dr. R. C. Carey, University of Illinois Bureau of Institutional Research.

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the 1920's and the 1960's. During the 1920's, state appropriations and private gifts to higher education underwent dramatic increases from the outlays derived from these two sectors in the past.[2]

> "Growth — in student numbers, and the size of university budgets and physical plant — these were the characteristic developments of the 1920's."[2]

This investment during the 1920's resulted not only in increased attendance in institutions of higher education but also in the increased production of faculties for the growing enterprise. The similarity in the experience of the 1920's and the 1960's is remarkable. One interpretation of the slowing in the growth rate of the educational enterprise during the years of the depression is that "the net effect of the depression was not to reduce, but to stabilize the number of students enrolled in colleges."[2]

It is tempting to juxtapose this interpretation of what happened in the 1920's and the 1930's to the present, which marks a somewhat similar circumstance at the end of the 1960's and the beginning of the 1970's; this recognition, however, should not obscure the fact that investment in human resources can itself transform "economic realities" as well as the entire social and environmental setting in which the activities occur.[3]

DEMOGRAPHY AND DEGREES

A source of confusion in understanding the growth of higher education is the fact that no clear distinction is usually made between the total magnitude of growth and the relative rates of growth of the several sectors comprising the higher education enterprise.

The potential size of student demand for higher education is usually embodied in the statistic referred to as the "enrollment rate." The enrollment rate is intended to provide an index of the propensity for college attendance. It is a factor which presents the total number of students enrolled on campus (of any age group) divided by the current college age population (ages 18-21 inclusive). The current enrollment rate for higher education is estimated to be approximately 50 percent for the nation; in 1980 it is projected to be approximately 55 percent. (The current enrollment rate for the State of Illinois is 60 percent and is projected to be approximately 75 percent in 1980.)[4] The numerator of this factor represents a combination of different and distinct groups of students enrolled in junior colleges, undergraduate programs at four-year colleges and universities, and graduate and professional programs at colleges and universities. It is this combination of different groups of students which gives the enrollment rate statistic its complexity. Any future projection of enrollment rates based upon the mere projection of recent enrollment rate trends is misleading, since enrollments in junior colleges and other two-year institutions have increased dramatically during the past decade. In addition, there is an increased tendency for students to remain in the educational system beyond the attainment of the bachelors degree, as we have witnessed in the rapid growth of enrollment for advanced degrees. These two growth rates have coupled to distort any statistical correlation between total enrollments and total degree output.

In order to avoid this distortion, a much more informative model is based upon a graduating cohort of high school students expected to obtain a baccalaureate-level degree four years after graduation from high school, a masters-level degree approximately six years after graduation from high school, and a doctorate approximately ten years after graduation from high school. Students usually graduate from high school when they are seventeen or eighteen years of age. If they attend college, and if they perform acceptably, they progress to the four-year baccalaureate by age 21 or 22. The median time necessary to advance from the baccalaureate to the masters level is from one and one-half to two years. The median years from baccalaureate to doctorate is reported to be somewhat more than five years of registered time and approximately eight years of total time.[5] The model developed in this paper and the plots in Figures 2 through 7 use the following age groups as the base from which the four degree levels are derived for any particular year: (a) 17 plus 18 year olds divided by two equals the population base for high school graduates; (b) 21 plus 22 year olds divided by two equals the population base for bachelors degrees; (c) 23 plus 24 year olds divided by two equals the population base for masters graduates; (d) 27 plus 28 plus 29 year olds divided by three equals the population base for doctorate graduates.

Figure 2 presents a comparison of the growth of the total population of the United States and the growth of the

FIGURE 2

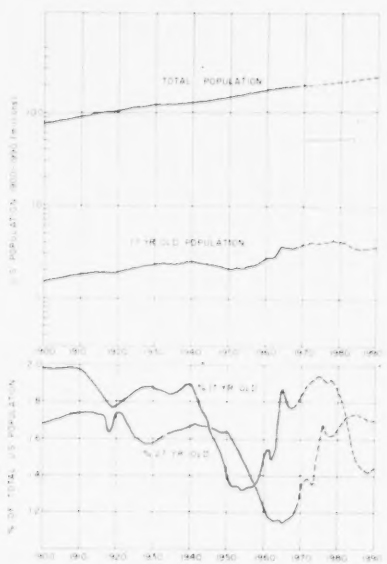


FIGURE 3

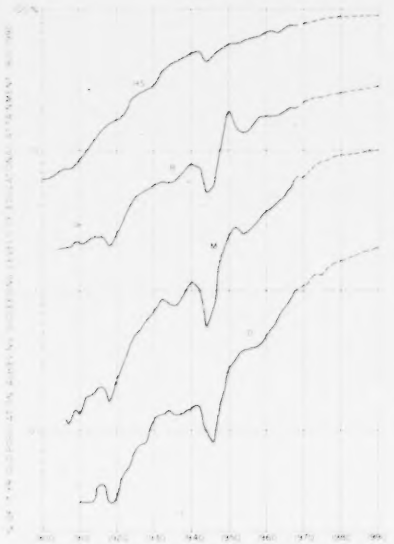
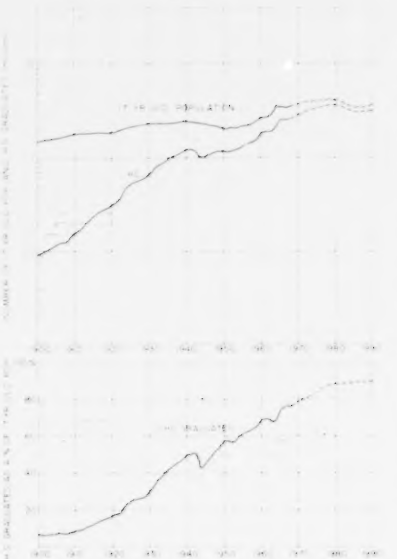


FIGURE 4



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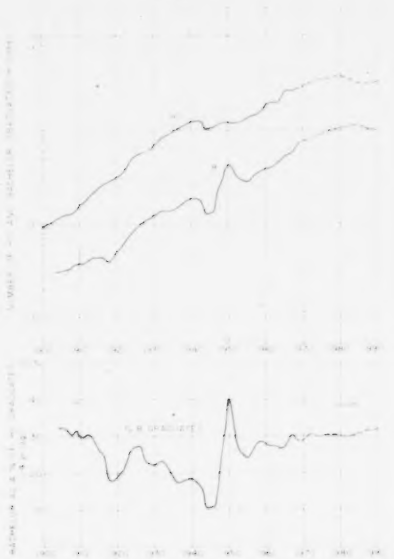


FIGURE 6

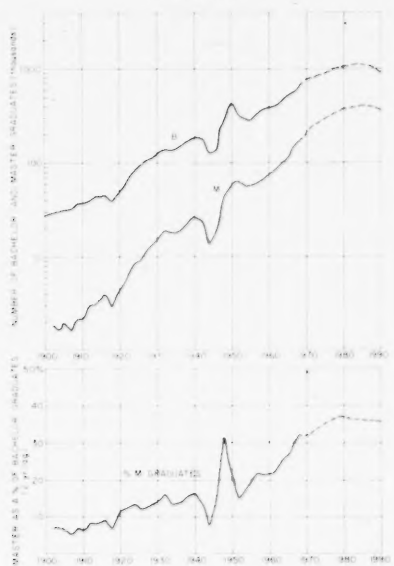
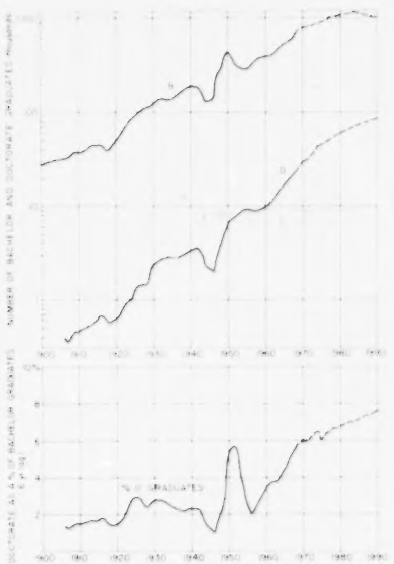


FIGURE 7



seventeen-year-old population. The bottom half of Figure 2 presents the seventeen-year-old population (17 plus 18 divided by two) and the twenty-seven-year-old population (27 plus 28 plus 29 divided by three) as a percent of the total population. These two age groups encompass the normal time span during which the award of degrees has historically been observed. These age groups are, for all practical purposes, the population base for the high school diploma and for the doctorate degree.

Although the lock-step pattern of education assumed by this model may change, several references can be studied to show that there is substantial evidence for the realism of this model and in the aggregate it is valid for our purposes.[5, 6]

The model, therefore, establishes the seventeen-year-old population as the only independent variable which can be used in studying the effects of past and future policy-making upon the growth rates of the various levels of educational attainment. In this respect, it is important to note that the available population from which can be drawn the future enrollments in higher education — the seventeen-year-old population — peaks in the late 1970's

and begins to decrease in the late 1980's. Since we must plan for the trained manpower required to sustain a burgeoning population which apparently begins to decrease its rate of growth at the end of the century, we must also note that, as a percentage of this total U.S. population, the high school age population peaks in 1978, the baccalaureate age population peaks in 1982, and the masters and doctorate population peaks in the mid- to late 1980's. The importance of these considerations can of course be obscured by new educational "delivery systems."

OBSERVATIONS DERIVED FROM THE DATA

The model which has been developed defines the higher education "pipeline" as approximately a ten-year period extending from the award of the high school diploma through the period during which we would normally expect to award the bachelors, masters and doctorate degrees. Figure 3 incorporates the implicit lags between each of these degree levels and presents the percent of high school age population achieving succeeding levels of educational attainment over time since 1900. Again it can be noted that the baccalaureate degrees parallel the high school awards, while the percentage of masters and doctorate degrees awarded to the high school age cohorts is increasing over time.

Figures 4 through 7 present a comparison of each of these levels of educational attainment with the previous degree base from which they are derived. The bottom half of these figures present each degree as a percent of the previous degree base. The conclusions to be gleaned from Figures 4 through 7 are: (a) high school awards are asymptotically approaching the total high school age population; (b) baccalaureate awards as a percent of high school awards have been most sensitive to wars and economic fluctuations, but, it can be observed, have established a fairly long-term constant relationship with high school awards at approximately 30 percent of an increasing number of high school graduates; (c) masters awards as a percent of baccalaureate awards show a long-term, fairly constant rate of increase up until 1960 when this rate of increase accelerates dramatically; (d) doctorate awards as a percent of baccalaureate awards demonstrate sensitivity to wars and economic fluctuations, and also demonstrate a fairly constant rate of increase until 1960 when this rate of increase also accelerates dramatically.

It is apparent that while the nation has expanded educational attainment up to and beyond the baccalaureate level, the baccalaureate degree itself has stabilized as a "gate." There have been real increases in educational attainment on either side of the baccalaureate degree resulting in a "bi-modal" distribution of educational attainment. Beyond the baccalaureate it has been possible to increase relatively the master and doctorate degree productivity, most recently in the post-sputnik period. In the meantime, the public education system has consistently raised the general level of ability in the population as a whole by providing public education at the elementary and high school levels. In the last half of this century, a high school education has become the norm of educational attainment for the youth of the nation. Furthermore, during the last decade, a new goal for American education has been to provide the youth of the nation with an opportunity for at least two years of education beyond high school. This goal is rapidly being realized through the phenomenal growth of various types of two-year colleges which attract a highly diversified group of students, including a substantial number of individuals from minority groups, low income families, or educationally disadvantaged backgrounds. Four-year colleges and universities are less likely to enroll large numbers of these students, since such institutions tend to be more selective, more expensive and generally not located near urban areas.[8]

The junior colleges (community colleges) currently enroll some two million students out of the total higher education enrollment of approximately eight million students. The number of two-year institutions of higher education has increased from approximately 500 in 1959 to approximately 800 in 1969.[9]

Table 1 presents the summary of headcount enrollment in all institutions of higher education for 1959-60 and 1969-70. The table illustrates that the dramatic increase in total enrollment has occurred primarily in the public sector and in the two-year institutions. Table 2 illustrates that, as a percent of total enrollment in all institutions of higher education, the two-year institutions have gained a significant proportion of the total enrollments, while the four-year institutions have lost a similar proportion of the total, and enrollment in graduate programs has remained at about a constant proportion of the total headcount enrollment in all institutions of higher education.

Table 3, a summary of earned degrees awarded by all institutions of higher education, illustrates increased degree output which can be compared to the increased enrollment emphases described in Table 1. In each of the degree levels awarded by institutions of higher education, the increase in degree output over this period exceeds the corresponding increase in enrollments which have been observed. This observation is even more significant when we consider that there is an implicit lag between enrollment increase and degree output.

The effect of the junior college sector upon the expansion of higher education is also obvious from the fact that, although up to the late 1950's baccalaureate degrees represented approximately 60 percent of first time degree-credit enrollment in all institutions of higher education, this percentage has decreased to approximately 50 percent at the current time. Baccalaureate degrees as a percent of first time degree-credit enrollment is projected to

TABLE 1. SUMMARY OF HEADCOUNT ENROLLMENT IN ALL INSTITUTIONS OF HIGHER EDUCATION 1959-60 AND 1969-70[1]

	1959-60	*1969-70*	*% Change 1959-60 to 1969-70*
Total Enrollment[a]	3,571,000	7,697,000	+116%
Public	2,134,000	5,619,000	+163%
Private	1,438,000	2,077,000	+ 44%
Degree Credit	3,377,000	7,087,000	+110%
Non-Degree Credit	194,000	610,000	+214%
Degree Credit in:			
Two-year Institutions	410,000	1,341,000	+227%
Four-year Institutions[b]	2,636,000	4,948,000	+ 88%
Graduate Programs	331,000	798,000	+141%
Non-Degree Credit in:			
Two-year Institutions	153,000	527,000	+244%
Four-year Institutions[c]	41,000	83,000	+102%

[1] From USOE Projections of Educational Statistics to 1978-79
[a] Rounding of figures prevents adding to exact totals in all columns
[b] Including professionals, excluding graduate students
[c] Including professional and graduate students

TABLE 2. DISTRIBUTION OF TOTAL HEADCOUNT ENROLLMENT IN ALL INSTITUTIONS OF HIGHER EDUCATION 1959-60 AND 1969-70

	1959-60		*1969-70*	
Total Enrollment	3,571,000	100%	7,697,000	100%
Two-year Institutions	563,000	16%	1,868,000	24.5%
Four-year Institutions	2,677,000	75%	5,031,000	65%
Graduate Programs	331,000	9%	798,000	10.5%

TABLE 3. SUMMARY OF EARNED DEGREES AWARDED BY ALL INSTITUTIONS OF HIGHER EDUCATION 1959-60 AND 1969-70[1]

Degrees	*1959-60*	*1969-70*	*% Change 1959-60 to 1969-70*
High School	1,864,000	2,969,000	+ 59%
Associate[2]	48,613	184,113	+279%
Bachelors & First Professional	389,183	772,000	+ 98%
Masters	77,692	211,400	+172%
Doctorate	9,829	29,000	+195%

[1] From USOE Projections of Educational Statistics to 1978-79
[2] Associate degree data was not reported nationally in 1959-60 and is not available for 1969-70. Figures presented above for associate degree are for 1958-59 and 1968-69.

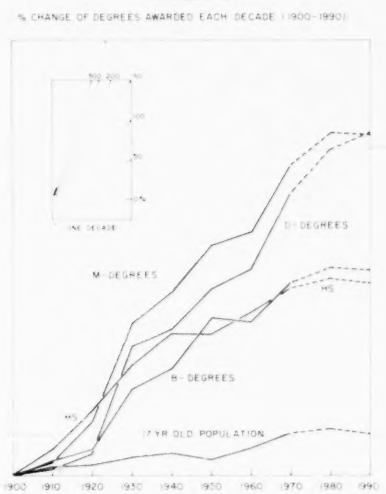
drop to 45 percent by 1980, indicating that (in the absence of a national policy change) an increasing proportion of high school graduates will be provided education beyond the high school level, but that these people will not achieve the baccalaureate level in large numbers.[10]

That junior colleges are primarily preparatory for continued advancement toward the baccalaureate is a myth. The fact is that only about five percent of these students currently transfer to four-year colleges and universities.[11] Recent studies have shown, however, that there are large numbers of junior college enrollees, who, if they were so predisposed, and if it were made financially possible, would transfer to senior institutions in large numbers.[5]

THE PROJECTIONS

The relative rates of growth of the four levels of educational attainment (high school, baccalaureate, masters, doctorate) are presented in Figure 8 for each decade since 1900. Since the middle 1940's, high school and baccalaureate awards have increased at approximately the same overall rate. The emphasis upon masters and doctorate output is a long term trend originating in the 1920's. The most recent emphasis upon masters and doctorate output during the 1960's affects the Office of Education projection methodology, which is based chiefly

FIGURE 8



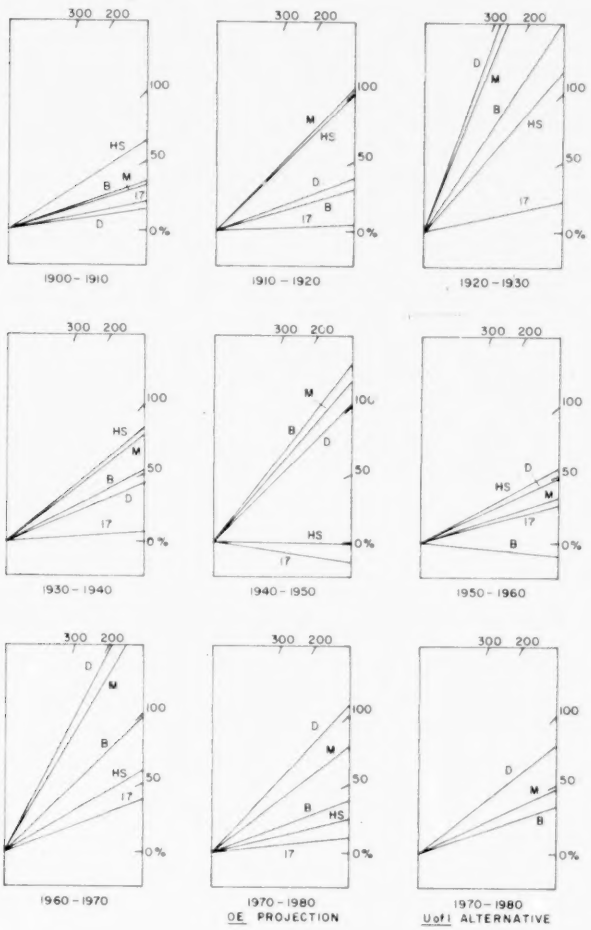
upon an extrapolation of recent trends. For example, during the 1960's the percentage growth rate of doctoral production in all fields varied between a ten and twelve percent annual growth rate. If this growth rate were sustained, doctoral production would approach 90,000 degrees per year by 1980. The Office of Education projection of some 60,000 doctoral degrees by 1980 would require an annual growth rate of some eight percent. The overall long-term growth rate of doctorate produc-

tion has been about six percent per year; if this growth rate were applied to the estimated 1970 doctorate base, by 1980 the annual doctorate production would approximate 50,000 degrees per year. The projections of Allan Cartter,[12] of Folger, Astin and Bayer,[13] of the National Science Foundation,[14] and of a study performed by the University of Illinois in 1969[15] indicate that by 1980 a doctorate supply of approximately 50,000 graduates per year can be achieved. But there is little agreement as to the distribution of these graduates by areas of study.

Figure 9 presents for each decade since 1900 the percent change of degrees awarded each decade, as derived from the long-term growth curves of educational attainment presented in Figure 8. (Table 4 provides a conversion of percent increase per decade to an annual compound rate of growth.) These decade "snapshots" portray the relative emphasis placed by the nation upon each of the levels of educational attainment in respect to the others, and they portray the rate of growth of the seventeen-year-old population during that decade. Figure 9 demonstrates the effects of the large societal investment in higher education during the 1920's and the 1960's, and reflects the "catching up" which occurred after World War II. Figure 9 also reflects the periodic growth rates of educational attainment, and traces the effects of national policy and history since 1900.

FIGURE 9

% CHANGE OF DEGREES AWARDED EACH DECADE (1900-1980)



The model developed in Figures 8 and 9 can be expanded to include junior college outputs and can be used to examine and test alternative ways to raise the educational attainment of American youth. If a consensus can be reached concerning the relative value of decreasing the growth rate of one or more sectors and increasing the growth rate of one or more other sectors, the model can be run in reverse to determine the necessary numerical outputs of each degree level in order to meet a stated national objective for the educational enterprise. The political, economic, social and technological implications of determined objectives can be further distilled into a distribution of desired educational attainment in each of the several broad areas of study. To this end, we can utilize the recent relationship of doctorate output to baccalaureate degrees awarded several years earlier in each of the Office of Education broad study areas. Questions revolving about the distribution of educational attainment among males versus females, whites versus non-whites, domestic versus foreign students, etc., requires an in-depth historical analysis of these relationships over the period developed for this model. Only when all of these factors are considered can we predict with any degree of certainty the multi-faceted details of educational attainment to be expected from consciously selected alternative sets of national goals.

TABLE 4. CONVERSION OF PERCENT INCREASE PER DECADE TO ANNUAL COMPOUND RATE OF GROWTH

Percent Increase Per Decade	*Annual Compound Rate of Growth (Approximate)*
50	4.2
100	7.3
150	9.6
200	11.7
250	13.4
300	14.9

Within the resource constraints dictated by a set of national goals and priorities, and in the absence of something more than the current punitive mood of state and federal government toward higher education, it is clear that higher education cannot sustain the 12 percent growth rate of doctorate production which prevailed in the 1960's. Indeed, within the existing funding constraints, it is difficult at this time to imagine that higher

education can sustain the long term six percent growth rate of doctorate production. If the nation were to revert to the emphasis upon educational attainment which prevailed in the 1930's and 1940's, then clearly we can expect that increased emphasis will be placed upon the baccalaureate level of educational attainment during the 1970's.

THE CONCLUSIONS

The size of the seventeen-year-old population is the only factor which can be established as an independent variable in future policy decisions regarding educational attainment. The numbers of these people receiving high school diplomas is asymptotically approaching 100 percent. The baccalaureate level of educational attainment has been established as a "gate." Below this level of educational attainment, the rapid expansion of the junior college system and the rapidly increasing enrollments in these institutions, coupled with the long-term trend toward educational attainment beyond the baccalaureate level, lead to a "bi-modal" distribution of educational attainment. The long-term trends are sensitive to cyclical deviations caused by wars, economic conditions, and changing relative emphasis upon national objectives.

A major problem facing higher education in general is a wide-spread lack of understanding in government of the growth problems being created by the extension of educational opportunities in both segments of the bi-modal distribution of educational attainment. The following quotation from a Health, Education, and Welfare-sponsored panel (the Newman task force), which urges major overhaul of higher education, displays the naiveté with which the growth of the educational enterprise is considered:

> The task force said its study of access to higher education revealed, "A major phenomenon: The surprisingly large and growing number of students who voluntarily drop out of college." It said that it found that of the more than one million young people who enter college each year, fewer than half will complete two years of study and only about one-third will ever complete a four-year course of study. "College is failing to capture the attention and engage the enthusiasm of many students," the report states. "For some, it is a decidedly negative experience."

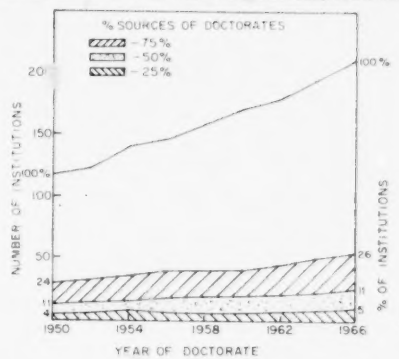
The passage condemns all of higher education because of a misinterpretation of statistics which may well indicate the initial success of the junior college system as a partner in higher education. The passage displays a clear misunderstanding of the developing role and function of the junior college system.

> "The main difficulty lies in the enormous range of student deficiencies to be overcome and the lack of adequate information about the motivational and learning patterns of disadvantaged students. . . . Another obstacle is the lack of wide-spread public understanding of the problems involved in training the type of students enrolled and the unwillingness of government at all levels to give adequate support to this effort. Effective remedial and developmental programs are expensive because they normally require a low student-faculty ratio."[5]

The junior colleges in a very short time seem to have achieved considerable success in raising the educational attainment of youth who elect to delay their entrance to the labor market by one or two years. However, a disparity exists between the aspirations created by the selling of the junior college system as a route to the baccalaureate and the achievement of those aspirations when they coincide with the attainment of the baccalaureate. One wonders what effect the large supply of seventeen-year-olds during the 1960's has had on the decision to delay entrance to the labor market. Chronic unemployment in the post-high school age group may well have induced this delay, but the 1970's will bring a leveling of this age group and the 1980's will witness a decline in their real numbers.

Whatever policies are pursued in the future, and whatever national goals and priorities evolve, it is important to recognize the existing comparative advantage among institutions of higher education and the need to establish a favorable division of labor in the delivery of their services. The need to specialize is emphasized in Figure 10,

FIGURE 10. NUMBER OF U.S. INSTITUTIONS THAT GRANTED 25%, 50%, AND 75% OF ALL DOCTORATES, 1950-1966



Source: NRC, Office of Scientific Personnel, Doctorate Records File.

which demonstrates the high concentration of expensive advanced degree programs at a relatively small number of institutions. Just as the junior colleges are the intermediate but most often final level of formal educational attainment for a large proportion of our youth, the predominantly four-year institutions are the culmination of educational aspirations at the lower end of the age spec-

trum for formal educational attainment, and certain universities can be described as the capstone at the other end of the bi-modal age distribution of educational attainment. But education is becoming increasingly recognized as a continuing experience for all age groups, and we can only speculate at this time on the effects that resultant changes in the lock-step model will have upon all of higher education.

Regardless of where relative emphasis is placed in the future, the established principle for the entire educational system must be a selective investment in quality: (a) improve the quality of educational attainment in the elementary and secondary school systems; (b) improve the quality and expand occupational preparation in the two-year colleges; (c) improve the quality of the programs at the baccalaureate level where institutional growth can and must be provided; (d) preserve advance degree programs of high quality where they presently exist.

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